State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES
Northern District

RECREATION USE SURVEY OF INDIAN CREEK, PLUMAS COUNTY 1982

Technical Information Report No. 83-1

Prepared by

Ralph N. Hinton, Chief, Recreation Section

This report was prepared to summarize information collected under WO 1600-4268 as part of an evaluation of the revised operation of Antelope Reservoir, an element of the Department's Instream Water Use Program. This report has received only limited review; it is intended for internal use and should be considered preliminary and subject to revision.

April 1983

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SUMMARY

A survey of streamside recreation along upper Indian Creek, Plumas County, was made in 1982. This survey was the last year of a five-year program to estimate the amount and types of recreation occurring with augmented flow conditions. The random sample survey combined roving use counts with interviews of anglers to gather information on recreation activities, visitor origin, and angler success.

There were an estimated 35,600 hours of recreation use on upper Indian Creek between April 24 and November 15, 1982. The most frequently observed activities were camping, fishing, relaxing, and picnicking. About 43 percent of the anglers lived in the northeast counties of California, mostly Plumas and Lassen Counties. Anglers caught about 4,300 brown trout and 4,780 rainbow trout in 13,500 hours of fishing on the creek.

General recreation, fishing, and total trout catch were roughly double the averages of the previous four years. The cause of this large increase is uncertain, but possible reasons include: (1) a large number of rainbow trout spilled into Indian Creek from Antelope Reservoir, (2) adult brown trout populations have increased, (3) high flows made the stream attractive all summer, and (4) there were no campfire restrictions along the stream in 1982. The 1982 data are compared with results of previous surveys.

INTRODUCTION

Indian Creek below Antelope Dam offers an opportunity to implement the Department of Water Resources (DWR) water management policy, adopted in 1975, which states, "Instream uses for recreation, fish, wildlife, and related purposes shall be balanced with other uses." When Antelope Dam began operation in 1964, streamflows in Indian Creek below the dam were increased and stabilized. Minimum flows were increased from about 0.08 m^3/s (3 ft^3/s) to 0.28 m^3/s (10 ft^3/s), resulting in a five-fold increase in trout populations several years later (Gerstung, 1973). Presumably, fishing and related recreation along the creek were likewise enhanced. Further increasing the flow to 0.56 m^3/s (20 ft^3/s) would roughly double trout habitat over post-project levels (DWR, 1979).

On a trial basis, Antelope Reservoir was reoperated for a three-year period starting in March 1978 to increase flows in the creek in an effort to enhance recreation and fishery values without significant detriment to lake recreation. Streamflow releases were maintained at 0.56 m^3/s (20 ft^3/s) during 1978 and 1980 and the effects on recreation were monitored (Cartier, 1979, and Haines, 1981).

Severe drought conditions in northeastern California during winter 1978-79 (spring runoff in Indian Creek was 35 percent of normal) caused the release to be reduced to 0.28 m^3/s (10 ft^3/s) in January 1979. This was done to assure filling of Antelope Reservoir and to avoid the possibility of an even lower release during summer 1979. The release from Antelope Dam was maintained at 0.28 m^3/s (10 ft^3/s) from January 19, 1979, to April 20, 1980, and the effects of this schedule on recreation were monitored (Haines, 1980).

Information obtained during the three-year evaluation was summarized in a Northern District report that recommended the revised operation continue on a permanent basis (Hinton and Haines, 1981). The report also recommended limited monitoring of trout populations, recreation use, and fishing success in the upper 18 km (11 mi) of Indian Creek. About 60 percent of the fishing use and 80 percent of the trout catch occurs in this portion of the creek. Limited monitoring of this reach would document any changes in fish populations, angler use, and catch resulting from the higher flows released during the three-year evaluation period and later.

This report describes the second year of limited monitoring, a recreation use survey and creel census conducted along the upper creek during the 1982 trout season, April 24 to November 15. A separate report, prepared by the Department of Fish and Game (DFG), Contract Services Section, will describe the fish population survey conducted in September 1982 (Villa, M.S.).

DESCRIPTION OF STUDY AREA

Indian Creek is a major tributary of the East Branch of the North Fork Feather River in Plumas County. It has a rich history of gold mining, ranching, and lumber production. In recent decades, recreation use has increased rapidly with water a major attraction. Employment today is divided among services, government, logging, and lumber manufacturing. Indian and Genesee Valleys support large cattle ranches.

The 1982 study area included 18 km (11 mi) of Indian Creek from Flournoy Bridge upstream to Antelope Dam (Figure 1 and Appendix I). Antelope Reservoir filled and began spilling on November 24, 1981. Major storms and the resulting heavy snowpack caused a record runoff in Indian Creek during the 1981-82 water year. The reservoir release and spill ranged from 1.27 to 15.5 m^3/s (45 to 548 ft^3/s) between November 1981 and June 1982 with the peak flow occurring during a severe storm in mid-February. Reservoir spill ended on July 18, 1982, and the downstream release was maintained at 0.56 m^3/s (20 ft^3/s) the rest of the year, except for five days in September when the release was reduced to 0.14 m^3/s (5 ft^3/s) to permit fish population sampling.

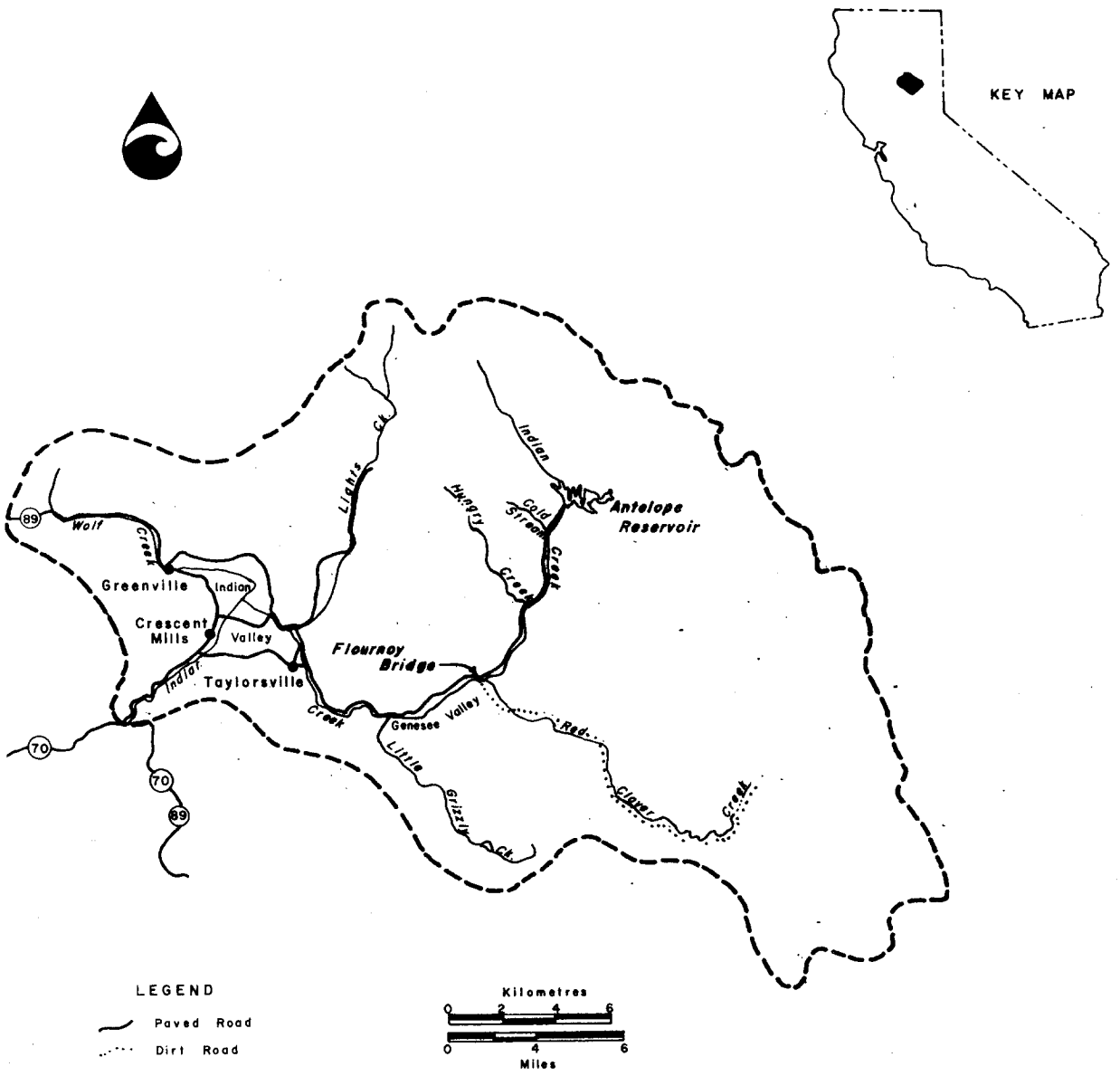

Figure 1 – Antelope Reservoir and Indian Creek, Plumas County, 1982.

METHODS

Recreation Use Counts

Use counts were made on randomly selected dates within nine survey strata using the optimum allocation method described by Abramson and Tolladay (1959). Thirty days of the 206-day period from April 24 through November 15, 1982, were surveyed; both days of the opening weekend of trout season, 6 of 9 holiday weekend days, 13 of 143 weekdays, and 9 of 52 weekend-days. Five one-hour counts of recreation use were made in the study area each day at regular periods, scheduled according to the number of daylight hours (Appendix II).

The surveys were made from a vehicle or on foot, as necessary, to check access and recreation sites. Recreationists (and their vehicles) were counted and recorded by recreation activity (Appendix III). The five daily counts were totalled and multiplied by factors that accounted for recreation use in the daylight periods not counted. Similarly, the resulting daily figures were expanded to estimate total recreation hours for all days in each stratum. Adding the stratum totals provided an estimate of recreation hours for the study period.

In early August a major timber salvage program began near the Elephants Playground area south of Indian Creek. Six to twelve loggers, truck drivers, and construction workers camped at suitable locations along Indian Creek for the rest of the summer. We subtracted these "campers" from the recreation use counts and did not include them in the estimates of use because they were usually not at their campsites during the day and generally did not engage in recreation along the creek.

Creel Census

Anglers along Indian Creek were contacted on 31 days to determine fishing success. The county of residence and length of time spent fishing so far that day was recorded for each angler contacted. Fish censused were counted, measured (fork length to nearest 0.5 cm--0.2 in), and identified to species.

To determine total catch, the catch per hour was multiplied by estimated hours of fishing for each stratum. Total weight of trout caught was calculated from estimated total catch and lenght-weight data from Indian Creek trout (Villa, 1982).

RESULTS

Recreation Use

Total recreation use on upper Indian Creek was estimated at 35,600 recreation hours (± 8,600 hours) for the period April 24 to November 15, 1982.

Overall, camping was the major activity, followed by fishing, relaxing, and picnicking (Table 1).

TABLE 1

RECREATION HOURS BY ACTIVITY
UPPER INDIAN CREEK, 1982

Activity	Recreation Hours	Percent
Camping	14,500	41
Fishing	13,500	38
Relaxing	3,000	8
Picnicking	1,400	4
Gold Seeking	600	2
Miscellaneous/Other 1/	2,600	7
Total	35,600	100

1/ Includes children playing, sightseeing, walking, swimming/beach use, bird watching, riding, and miscellaneous other activities

Creel Census Data and Angler Success

During the 1982 trout season, 901 anglers were contacted. They had fished 1,813.5 hours, with a recorded catch of 470 brown trout (*Salmo trutta*), 564 rainbow trout (*Salmo gairdneri*), and 33 other fish. Total angling use was estimated at 13,500 (± 2,150 hours) or 4,500 angler days, with an estimated catch of 4,300 brown trout, 4,780 rainbow trout, 370 brown bullhead, and 10 smallmouth bass. In addition, more than 100 trout of both species were caught and released.

On the opening weekend of the trout season a Plumas County angler caught the two largest brown trout we observed in the survey. These fish were 70 cm (28 in) and 49 cm (20 in) in length. The largest trout was a seven-year-old female that weighed nine pounds and had spawned at least three times.

The mean length of brown trout caught during 1982 was 21.8 cm (8.6 in) with a range of 13 to 70 cm (5.1 to 27.5 in) (Appendix IV). The mean length of rainbow trout was 23.6 cm (9.3 in) with a range of 13.5 to 66 cm (5.3 to 26.0 in) (Appendix V). An estimated 454 kg (1,000 lb) of brown trout and 670 kg (1,480 lb) of rainbow trout were caught.

Indian Creek angler origin was similar to previous years; most of the fishermen came from the northeast counties, San Francisco Bay area, and Sacramento Valley (Figure 2).

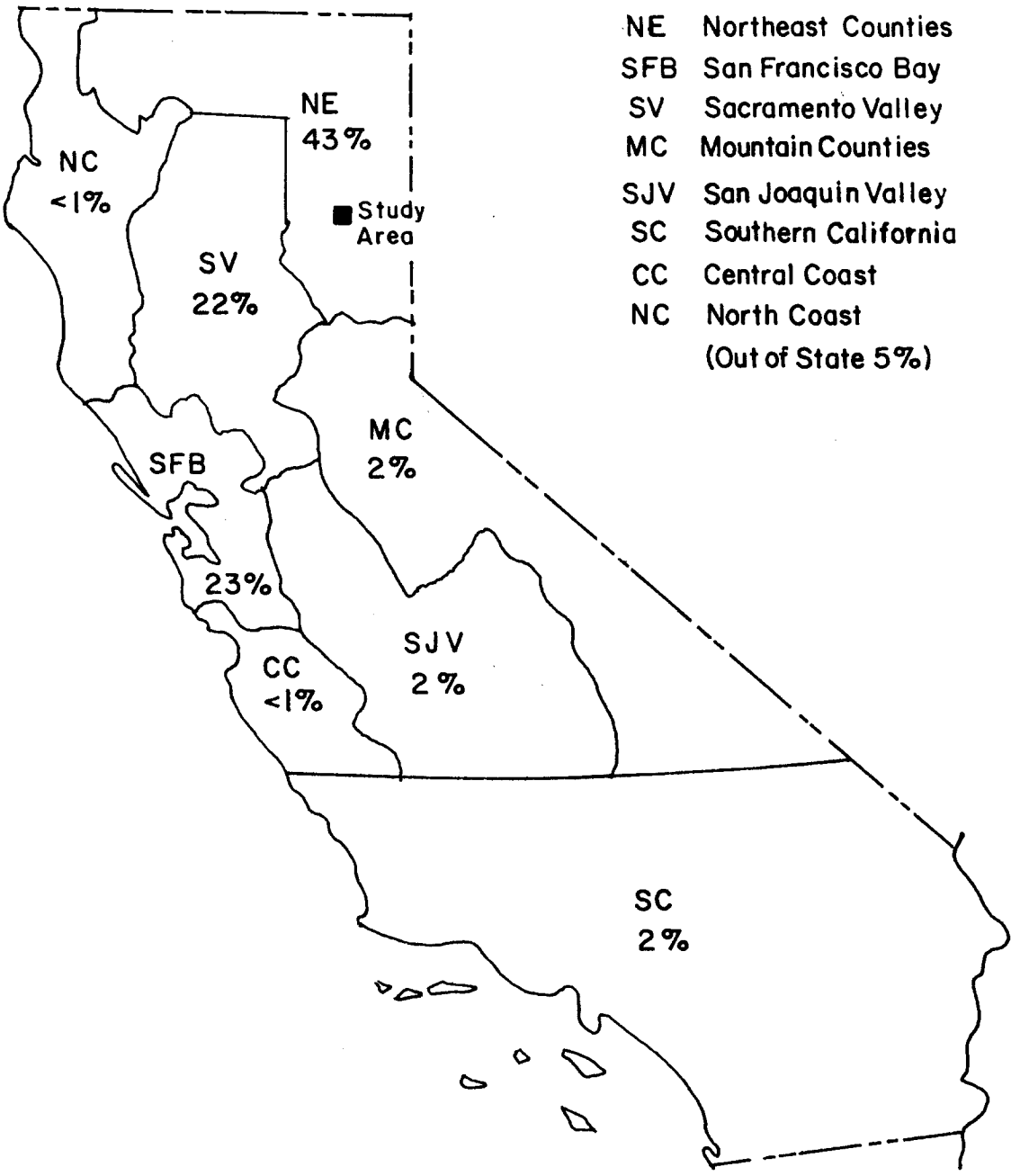

Figure 2- Indian Creek Angler Origin by County Groups

1982

DISCUSSION

Understanding the limitations of the recreation use survey and creel census helps put the data obtained in perspective. This section describes the limitations and compares data from the past five years (1978-82).

Limitations of Use Counts and Creel Census

Most recreationists on the creek were readily observed during the use counts. Vehicle access points were checked on each count, but people were not found for some vehicles. Vehicles of U. S. Forest Service (USFS) workers, loggers, and other non-recreationists are often parked along the road in this reach of Indian Creek, making vehicle counts a poor index of recreation use. However, from counts of vehicles not associated with people, it appears the estimate of total recreation use could be as much as 30 percent low, a figure similar to previous years.

About 13 percent of the estimated fishing use was represented in the creel census. This is considerably lower than previous years.

Comparison of 1978-82 Survey Results

The first three reports on the Indian Creek survey summarized data for the entire stream. In 1981 and 1982, the survey included only the upper 18 km (11 mi) of the creek. A comparison of data from all five years illustrates the changes that have occurred in general recreation, fishing, and angler success in this reach.

Recreation in 1982 increased sharply over previous levels (Table 2). This was true of every major activity except gold seeking. General recreation and fishing were roughly double the average of the previous four years. The very wet winter and spring reduced the fire hazard all summer and USFS did not restrict camp fires along the creek for the first time in several years. This probably encouraged additional camping.

TABLE 2

ESTIMATED RECREATION HOURS BY ACTIVITY
UPPER INDIAN CREEK, 1978-82 1/

Activity	Year				
	1978	1979	1980	1981	1982
Fishing	7,000	3,400	8,800	3,600	13,500
Camping	5,600	7,700	8,000	4,500	14,500
Relaxing	4,200	5,150	2,600	2,000	3,000
Picnicking	300	500	700	800	1,400
Gold Seeking	300	200	400	1,600	600
Miscellaneous/Other	1,200	1,050	1,700	1,000	2,600
Total	18,600	18,000	22,200	13,500	35,600

1/ Source: DWR Technical Information Report Nos. 79-1, 80-1, 81-1, 82-1, and this report

Fishing use and catch of brown and rainbow trout were the highest we have recorded (Table 3). Despite much higher angling pressure, the catch per hour for both species was similar to previous years when the reservoir spilled (1978 and 1980) and late summer flows were maintained at 0.56 m^3/s (20 ft^3/s).

After five years of surveys, a period that included a wide range of streamflow conditions, it is apparent that high flows attract more anglers to the stream than low flows. Presumably anglers know that rainbow trout leave Antelope Reservoir when it spills and fishing downstream will be good. The higher flows also make the stream look better for fishing and increased angler use continues long after the reservoir spill ends and most of the rainbow trout have been caught. Fishing success for brown trout has remained about the same irrespective of angling pressure so higher use results in more trout caught. The catch per hour and total catch of rainbow trout roughly reflect the number of trout entering the stream when Antelope Reservoir spills.

TABLE 3

STREAMFLOW AND ESTIMATED ANGLER USE AND CATCH
UPPER INDIAN CREEK, 1978-82 1/

Year	Streamflow Conditions	Angler Hours	Brown Trout # BT Caught	Brown Trout Catch/ Hour	Rainbow Trout # RT Caught	Rainbow Trout Catch/ Hour	Total Trout # Trout Caught	Total Trout Catch/ Hour
1978	Spill 46 days and 0.56 m^3/s	7,000	3,465	0.50	1,400	0.20	4,865	0.70
1979	Spill 20 days and 0.28 m^3/s	3,400	1,330	0.39	410	0.12	1,740	0.51
1980	Spill 177 days and 0.56 m^3/s	8,800	2,950	0.34	2,835	0.32	5,785	0.66
1981	No spill and 0.28 m^3/s	3,600	1,400	0.39	200	0.05	1,600	0.44
1982	Spill 237 days and 0.56 m^3/s	13,500	4,300	0.32	4,780	0.35	9,080	0.67

1/ Source: DWR Technical Information Report Nos. 79-1, 80-1, 81-1, 82-1, and this report

Precisely what caused the large increase in use this year is not certain. However, the large number of rainbow trout in the stream, an increased population of brown trout, high flows that made the stream more attractive, and no fire restrictions all may have contributed to the higher use.

Five years of survey data has defined Indian Creek recreation and fishing quite well and provided some interesting incidental information. Use is normally heaviest in the spring months and about 50 percent of the annual recreation and 70 percent of the fishing occurs by the end of June. The major activities are typically camping, fishing, and relaxing. Overall, the best fishing occurs before July, although fishing for rainbow trout is best in spring while fishing for brown trout is best in fall. Angling use on weekends and holidays averages about three times the weekday levels, while fishing quality on weekdays is about 40 percent better than on weekends and holidays, probably because there is less angling pressure. Fishing is usually best in the morning hours (before noon) for both rainbow and brown trout, although evening fishing (after

4 p.m.) for brown trout is nearly as good. Morning and evening periods nearly always provide better fishing than mid-day.

Most of the exceptionally large fish observed in the creel census were caught on the opening weekend or early in the season, although the opening weekend always has the highest angling use of the year, but often not the highest success.

Local anglers (Plumas and Lassen County residents) who presumably know Indian Creek better than other anglers, are about 23 percent more successful in catching trout than residents of other counties (0.54 trout/hour versus 0.44 trout/hour).

ACKNOWLEDGMENTS

DFG Biologist Nick Villa and Environmental Specialist Sharon Haines directed several Fish and Wildlife Seasonal Aids who conducted the Indian Creek survey in 1982. DFG Aids Mike McCain, Ann Schenk, Tony Gallegos, and Jaci Hyatt conducted most of the surveys and creel censuses. Sharon and Ann compiled the data. DFG Aid Julie Schreck and DFG Biologist Harvey Reading also helped with the surveys.

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APPENDIX I

DESCRIPTION OF SURVEY REACH

Upper Indian Creek

The first 18 km (11 mi) of creek below Antelope Dam is closely followed by a paved road with wide pullouts for convenient stream access. The creek flows through a granite canyon timbered with pine and fir. Parts of the canyon floor are meadowlike, especially at the upper ends of the reach. Elevation ranges from 1 500 m (4,900 ft) at the dam to 1 100 m (3,700 ft) at Flournoy Bridge. All but the lower 1.6 km (1 mi) of stream is within Plumas National Forest. Water releases were controlled at about 0.56 m^3/s (20 ft^3/s) during the 1982 survey after Antelope Lake stopped spilling. The stream remains cold in summer due to deep-water outflow from the dam and is usually slightly turbid. Brown trout and rainbow trout dominate the fishery. Many rainbow trout and brown bullhead enter the creek from Antelope Reservoir when it spills. Sacramento squawfish and suckers also occur in the lowermost portion, where the creek enters Genesee Valley.

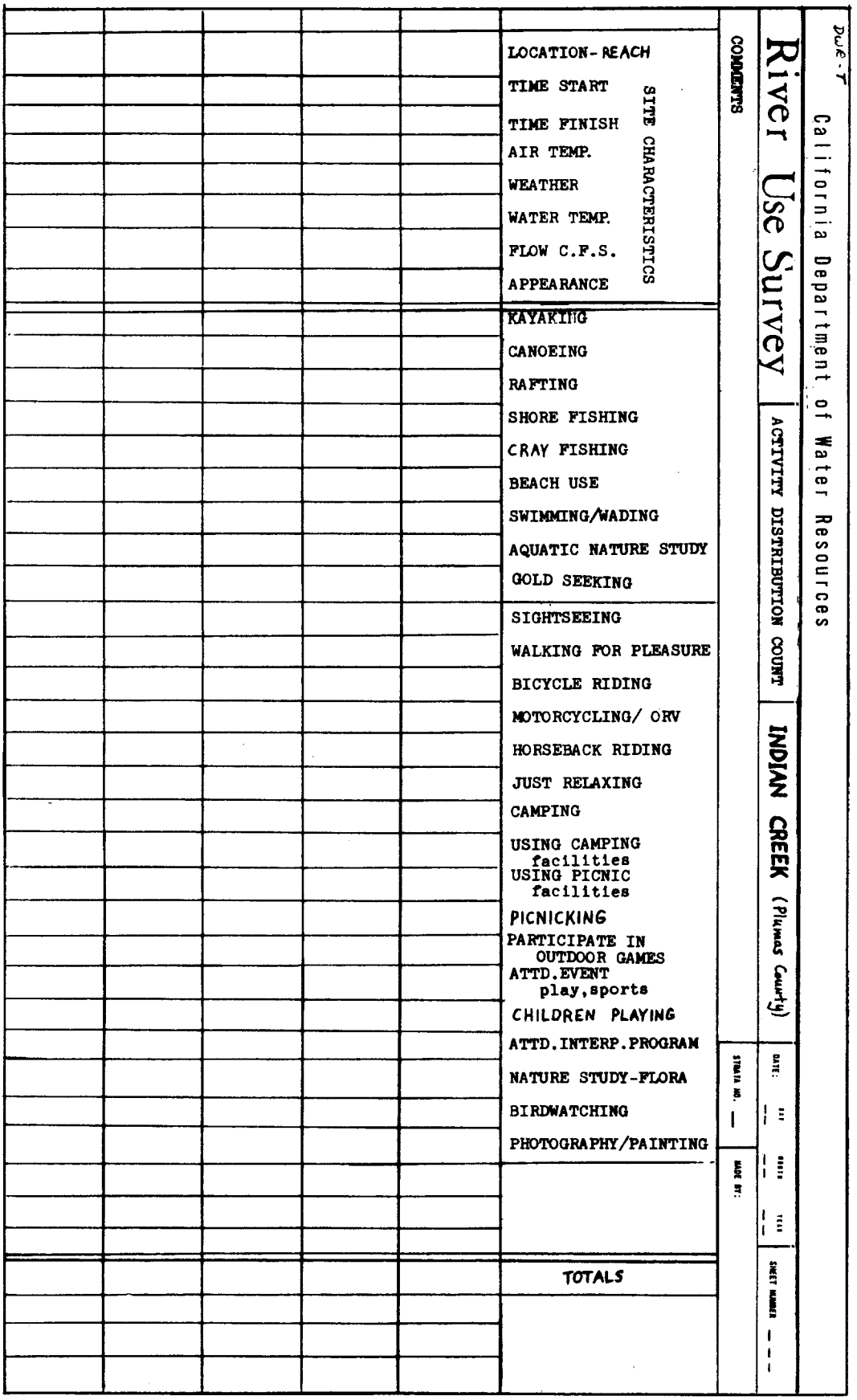
APPENDIX II

1982 INDIAN CREEK RECREATION
USE COUNT SCHEDULE

Date	Daylight Hours	Use Counts		Creel Census Time (approx.)
		Count	Time	
April 24 PST	15½	1st	0630-0730	0800-1200
		2nd	0900-1000	1400-1800
		3rd	1200-1300	
		4th	1430-1530	
		5th	1730-1830	
April 25 DST	15½	1st	0730-0830	0800-1200
		2nd	1000-1100	1500-1900
		3rd	1300-1400	
		4th	1530-1630	
		5th	1830-1930	
May-August DST	16½	1st	0700-0800	0900-1300
		2nd	1000-1100	1600-2000
		3rd	1300-1400	
		4th	1600-1700	
		5th	1900-2000	
September DST	14	1st	0730-0830	0900-1300
		2nd	1000-1100	1400-1800
		3rd	1230-1330	
		4th	1500-1600	
		5th	1730-1830	
October DST	13	1st	0800-0900	0900-1300
		2nd	1000-1100	1400-1800
		3rd	1230-1330	
		4th	1500-1600	
		5th	1700-1800	
November PST	12	1st	0730-0830	0800-1200
		2nd	0930-1030	1300-1700
		3rd	1130-1230	
		4th	1330-1430	
		5th	1530-1630	

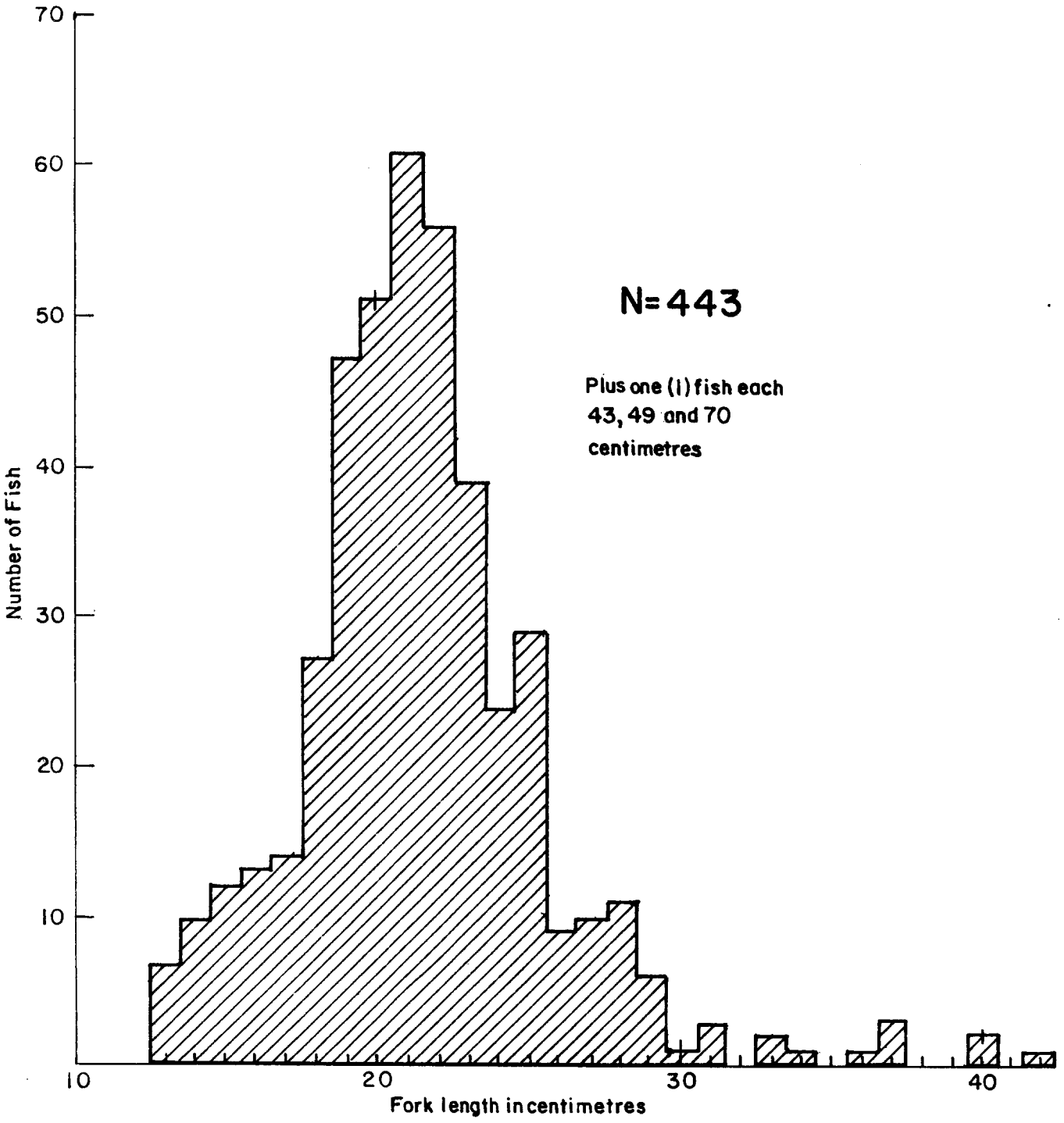
APPENDIX III

RECREATION USE SURVEY - USE COUNT FORM



Appendix IV

Length Frequency of Censused Brown Trout, Indian Creek, 1982



Appendix V

Length Frequency of Censused Rainbow Trout, Indian Creek, 1982